



September 14, 2007

[via email and Certified Mail Return Receipt]

Mr. Rich Gannon  
DENR-Division of Water Quality, Planning Section  
1617 Mail Service Center  
Raleigh, NC 27699-1617

RE: Comments on Proposed Jordan Lake Rules

Dear Mr. Gannon,

The City of Greensboro Water Reclamation Division of the Water Resources Department respectfully submits the following written comments concerning the proposed Jordan Lake Rules. We appreciate the opportunity to provide comments.

#### **Background Information**

The City of Greensboro owns and operates two water reclamation facilities that discharge to the Jordan Lake watershed. Greensboro comprises a major urbanized area within the Haw River watershed. As such, the City of Greensboro is not only a major point source discharger, but also serves as the front line of protection for the environment. Our employees have dedicated their careers to the effective and economical collection and treatment of municipal wastewaters. City governments do not create wastewater. It comes from our citizens, businesses, and industries. We treat this by-product so North Carolinians can realize their personal and professional pursuits. Those who live outside of our jurisdiction enjoy jobs, shopping, dining, and entertainment within our urbanized area. Phosphorus and nitrogen discharged to a wastewater treatment plant are pollutants that for the most part come from human beings and human waste. There are no major industrial sources of nitrogen and phosphorus that we can control through the industrial waste pretreatment program and require pretreatment at the industrial facility in order to remove these nutrients before discharge to the WWTPs.

As stewards of the environment and public funds, we must examine the issues, ensure sound science is applied and develop the best possible approach. The City of Greensboro supports phased implementation of nutrient controls, reasonable, attainable and well-defined non-point source programs, and true adaptive management practices.

The City of Greensboro Water Reclamation Division comments will generally be limited to a discussion of the Haw River Arm of Jordan Lake. The Haw River Arm of the Jordan Lake is very different hydraulically from the New Hope Arm of the lake. The Haw River Arm enters Jordan Lake at the bottom of the lake near the dam and thus, has a very short retention time in the lake. DWQ has two sampling points and the United States Geological Survey (USGS) has one sampling point on the Haw River Arm of the Jordan Lake.

## **Actual WWTP Nutrient Reductions Required by the Proposed Jordan Lake Rules**

In 1991, DEM (now DWQ) required all WWTPs on the Haw River to begin meeting a 2.0 mg/l total phosphorus NPDES permit limit and Greensboro spent millions upgrading both plants. The average total phosphorus WWTP effluent concentration prior to the upgrades was about 6.5 mg/l, requiring a 69% total phosphorus reduction at the WWTP in order to meet the new NPDES limit.

Now in 2007, in the real world of the wastewater treatment plants on the Haw River arm of Jordan Lake, the 5% total phosphorus reduction at the lake (proposed regulation target) translates to an *additional* 66.5 percent phosphorus reduction required at the treatment plants themselves.

The current NPDES permit limit for both Greensboro WWTPs is 2.0 mg/l. The proposed Jordan Lake Rules target concentration for both Greensboro WWTPs is 0.67 mg/l, a 66.5% reduction. The current NPDES Permit for the T. Z. Osborne WWTP, if left unchanged, would allow the plant to discharge 667 pounds per day of total phosphorus at design capacity. The proposed total phosphorus target in the Jordan Lake Rules would allow a discharge of only 223.5 pounds per day at design capacity, a 66.5% reduction.

This limit would be a phosphorus cap that would never be increased....ever...not a decade from now, not 25 years from now...no matter how many new people or new industries move into this area....*(or don't move to this area because of this rule!)*.

Likewise, the 8% total nitrogen reduction target at the lake translates to an almost 70% reduction in total nitrogen required at the wastewater treatment plants at design capacity. *The upgrades required to meet this substantial reduction in total nitrogen will cost the City of Greensboro \$75 million dollars and these upgrades will NOT include any increase in design flow at either WWTP, only the addition of total nitrogen reduction processes.*

## **The Jordan Lake Nutrient Response Model**

The City of Greensboro was one of the Project Partners for the funding and development of a Nutrient Response Model for the Jordan Lake. The predictions made by this model are the basis for the Nutrient Management Strategy and the Nutrient Reduction Targets contained in the Proposed Jordan Lake Rules.

The chlorophyll *a* data [for 1995-2000] provided by DWQ for use in the calibration of the Nutrient Response Model was not analyzed in accordance with the approved chlorophyll *a* analytical method in use by DWQ at that time. This fact was discovered by DWQ in early 2001, after the contract for the Nutrient Response Model had been signed and the model development and calibration had begun in earnest. The municipalities funding the \$410,000 model were not told of the problems with the chlorophyll *a* data until our modeling project was almost complete. Had we known about the chlorophyll *a* data problems we would never have agreed to fund the model until sufficient accurate and reliable chlorophyll *a* data were available. It is important to note that chlorophyll *a* and the North Carolina chlorophyll *a* water quality standard of 40 ug/l are the driving forces behind the model in that exceedances of this 40 ug/l standard are what the model attempts to predict.

When DWQ discovered the chlorophyll *a* data problem in early 2001, additional Jordan Lake sampling events were scheduled for calendar year 2001 [a total of 12 events starting April 30 and continuing until November 7, essentially 6 months during the "growing season"]. This was certainly an appropriate DWQ response to the lack of valid chlorophyll *a* data. However, the period of time containing the intensive [but not "extensive"] sampling also included one of the worst droughts of record, certainly not the most representative data set to use for model "calibration" when there was not sufficient "good data" to "verify" the model. The model was nevertheless submitted to the EMC in 2002 as required.

[Note: In 2001, the cities in the Haw River watershed offered to collaborate with the State to collect additional reliable data to be used for the model. DWQ staff responded that they did not have the time or resources to re-run the model. ]

We remain concerned about the validity of the Nutrient Response Model used for the Haw River Arm Strategy nutrient targets due to the quality and quantity of chlorophyll a data used to develop, calibrate and verify the Model, as well as the variability and uncertainty of the chlorophyll a analysis itself.

### **Chlorophyll a as a Measure of Designated Use Impairment**

The final regulations and nutrient management strategy must also include an examination of the current 40 ug/l North Carolina chlorophyll a water quality standard to determine if a relationship truly exists between the current chlorophyll a standard and actual “designated use impairment” of Jordan Lake.

The drinking water reservoirs in several Piedmont North Carolina cities (including Greensboro) have recorded chlorophyll a values in excess of 40 ug/l during the summer months. These reservoirs have no point source discharges and are currently subject to watershed protection ordinances which include buffers and activity/building restrictions. Certainly no one would consider all of these drinking water reservoirs to be “impaired” waters.

If no scientific relationship between chlorophyll a and actual designated use impairment can be verified, but the nutrient strategy is nevertheless based on compliance with the 40 ug/l chlorophyll a standard, we may find that the final nutrient strategy is *more restrictive* but not necessarily *more protective*.

### **DWQ Chlorophyll a Data Collection Frequency at each of the two Haw River Arm Sampling Sites [CPF055C and CPF055E]**

CY 2001 – 12 sample dates from April 30 through November 7 [essentially only 6 months of the year and virtually all during the growing season]  
CY 2002 – 0 Sample Dates by DWQ in CY 2002  
CY 2003 – 3 sample dates [1 in June, 1 in July and 1 in August – all during summer]  
CY 2004 – 0 Sample Dates by DWQ in CY 2004  
CY 2005 – 11 sample dates (however all DWQ chlorophyll a data from April 11, 2005 through August 23, 2005 has been invalidated by the DWQ Laboratory [DWQ issued memo of 11-7-2005] due to the samples not being analyzed in accordance with the approved chlorophyll a analytical method being used by DWQ at the time)  
CY 2006 – 12 sample dates  
CY 2007 – 1 sample date per month

### **HRCWA Special Study Description**

During the period from December 2001 through December 2004 DWQ performed only 3 sampling events on the Haw River arm of Jordan Lake.

In February 2005 when the Haw River Basin dischargers [Burlington, Greensboro, Mebane, Graham, Reidsville] discovered how few DWQ sampling events had been conducted since 2001, the group decided to fund an independent twice per month sampling effort at the two Jordan Lake Haw River arm sites [CPF055C and CPF055E]. Although chlorophyll a was certainly the focus of the special study, samples for nutrients and field parameters were also collected. This special study was conducted by commercial laboratories certified by DWQ to conduct the specific analyses included in the study. All Jordan Lake sampling and all nutrient and field parameter analyses were conducted by Meritech, Inc. Chlorophyll a analyses were subcontracted to Environment 1 since Meritech, Inc. was not DWQ certified to perform chlorophyll a analyses when the study began. Environment 1 had been certified by DWQ to perform

chlorophyll a analyses for many years. The cities funding the study did not participate in the study at all, with the exception of receiving the final laboratory results and paying the invoices!

The sampling began in March 2005 and final results are currently available through July 2007, a total of 29 months and 57 sampling dates.

### **Data Submittal: HRCWA Special Study Results**

Attachment 1 is a summary of the all data collected and analyzed by DWQ certified commercial laboratories as part of the Haw River Clean Water Agencies Special Study.

Attachment 2 is a summary of the chlorophyll a data collected by the HRCWA special study as well as DWQ data and USGS data collected on the Haw River Arm of Jordan Lake.

### **Chlorophyll a Testing**

There are several published and approved methods that can be performed to analyze samples for chlorophyll a. Standards Methods for the Examination of Water and Wastewater includes 3 methods: the HPLC, spectrophotometric and fluorometric methods. These methods may or may not result in comparable values on duplicate analyses within the same laboratory and/or split sample analyses between various laboratories. A recent (April 2007) split sample study conducted by DWQ among 4 laboratories [DWQ Lab, Meritech, Inc., Environment 1 and UNC-Wilmington Lab] resulted in 2 laboratories tracking with higher results [DWQ and UNC-W] and the other two laboratories tracking with lower results [Meritech, Inc and Environment 1] on the same samples. All three laboratories other than DWQ, were certified by DWQ to conduct chlorophyll a analyses and no significant deviations from the methods, protocols or procedures had been noted in the annual DWQ inspections of any of these laboratories. Thus, as stated previously, it is possible to get very different chlorophyll a results from various laboratories using various methods on the same samples.

DWQ notified representatives of the Haw River Clean Water Agencies on August 29, 2007 that they had concerns that the Environment 1 data (conducted by a different method than DWQ) did not track DWQ's data in the split sample study (conducted in April 2007) and that Environment 1 obtained consistently lower values than DWQ. However, in the split sample study, Meritech, Inc. (using the same method as DWQ) also obtained consistently lower values than DWQ. Thus, recent DWQ data on the Haw River Arm records values over 40 ug/l when the HRCWA special study samples do not show exceedances. Although Environment 1 has since switched methods for chlorophyll a analysis, it is important to note that Mr. John Melvin, owner of Environment 1 laboratory has stated that he has not invalidated the chlorophyll a data generated at his laboratory using the spectrophotometric method and analyzed as part of the HRCWA Special Study.

Chlorophyll a is an extremely important issue in the Jordan Lake Rules since the definitive "line in the sand" is the 40 ug/l water quality standard for chlorophyll a. Exceeding that standard more than 10% of the time results in "impairment". Thus, being able to ascertain what laboratory values are "correct" is crucial.

For most analyses, the answer to this dilemma would be easy. Simply obtain a commercially available known value standard from a third party and split it between all the laboratories to truly determine who is getting the "right" answers. *However, to complicate the chlorophyll a testing (and decision-making) even further, due to the nature of the analysis, there are no commercially available independent standards for chlorophyll a. Thus there is no tool to measure any laboratory's performance against a "known/certified standard".* Merely comparing data from various laboratories to see who is "closer to DWQ" is not a sufficient quality assurance/quality control measure in this case, particularly since there is a history of problems with the chlorophyll a analyses in DWQ's own laboratory.

### Chlorophyll a Data Summary

The following is a summary of the chlorophyll a data submitted with these comments:

<b>JORDAN LAKE HAW RIVER ARM SITE CPF 055C</b>			
<b>Time Period/Agency</b>	<b>Number of Data Points</b>	<b>Number of Values &gt;40ug/l</b>	<b>Percent of Values &gt; 40 ug/l</b>
2005-2007 DWQ	25	5	5/25 = 20%
March 2005-2007 HRCWA	57	3 (in June/July 07 - Drought)	3/57 = 5.3%
<b>TOTALS</b>	<b>82</b>	<b>8</b>	<b>8/82 = 9.7%</b>

<b>JORDAN LAKE HAW RIVER ARM SITE CPF 055E (Near Dam)</b>			
<b>Time Period/Agency</b>	<b>Number of Data Points</b>	<b>Number of Values &gt;40ug/l</b>	<b>Percent of Values &gt; 40 ug/l</b>
2005-2007 USGS	10	1 (in 6-2007 drought)	1/10 = 10%
2005-2007 DWQ	25	3	3/25 = 12%
March 2005-2007 HRCWA	57	0	0/57 = 0%
<b>TOTALS</b>	<b>92</b>	<b>4</b>	<b>4/92 = 4.3%</b>

<b>JORDAN LAKE HAW RIVER ARM SITE CPF 055E (Near Dam)</b>			
<b>Time Period/Agency</b>	<b>Number of Data Points</b>	<b>Number of Values &gt;40ug/l</b>	<b>Percent of Values &gt; 40 ug/l</b>
1991-2007 USGS	65	5 (1 in 1992, 3 in 2000/2001 drought, 1 in 2007 drought)	5/65 = 7.6%
<b>TOTALS</b>	<b>65</b>	<b>5</b>	<b>5/65 = 7.6%</b>

### Lack of Compliance Criteria

The Jordan Lake Rules do not include clear criteria for compliance determination. Measuring the mass nutrient loading at a particular site on the Haw River will only measure the flow and nutrient concentrations at that one location. It will not and cannot speak to the various land-use activities and nutrient reduction measures on-going in the Upper Haw River Basin. In addition, the mass nutrient loading may or may not be associated with the resulting chlorophyll a values in the lake itself. What happens if the nutrient loading is *decreasing* to the lake but the lake chlorophyll a values are *increasing*? What happens if the nutrient loading to the lake is *increasing* but the lake chlorophyll a values are *decreasing*? What happens if we are still getting different chlorophyll a values on lake samples split between two certified laboratories with one recording a value less than 40 ug/l while the other records a value greater than 40 ug/l? The uncertainty of the chlorophyll a test as an indicator of impairment as well as the uncertainty and variability of the chlorophyll a test itself must weigh heavily in any compliance criteria developed for these rules.

The City of Greensboro has contracted with an engineering firm to conduct a nutrient loading trends analysis on the Haw River. Although the study has not been completed in time for this submittal, we will make it available to DWQ upon completion.

## **Recommendations**

It is imperative that a decision of this magnitude be based on sound science and fair allocation of the nutrient reduction responsibility. If the price tag were only a couple of million dollars we might all still get on the bandwagon, despite our concerns. However, with a price tag of at least 1.5 billion dollars and the economic future of our region at stake, we need to be virtually certain of the outcome. The chlorophyll a data issues that have plagued this process from day one are a source of serious uncertainty as to the outcome, effectiveness and implementation of these regulations.

The Piedmont Triad Council of Governments will be submitting alternatives to some of the requirements in the current rule and we look forward to discussing these alternatives with DWQ and the Environmental Management Commission.

If you have any questions regarding any of the written comments or need any additional information, please feel free to contact me at 336-433-7229 or by email at [martie.groome@ci.greensboro.nc.us](mailto:martie.groome@ci.greensboro.nc.us).

Sincerely,

Martie Groome  
Laboratory and Industrial Waste Section Supervisor

cc: Allan Williams, Director of Water Resources  
Don Howard, Water Reclamation Manager  
Dr. Dave Moreau, Chair, NC Environment Management Commission  
Linda Miles, City Attorney

Attachments: Attachment 1- Haw River Clean Water Agencies Special Study Results [all data]  
Attachment 2- Chlorophyll a Data Summary 2005-2007 [HRCWA, DWQ and USGS]  
Attachment 3- USGS Data (correlates to Site CPF 055E) 1991-2007  
Attachment 4-Jordan Lake Map indicating sampling locations